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Tadao Yamamoto

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EXAMINER

MERKLING, MATTHEW J

ART UNIT

PAPER NUMBER

1764

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/716,903

Applicant(s)

YAMAMOTO, TADAO

Examiner

Matthew J. Merkling

Art Unit

1709

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6, 8, 10-16 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8, 10-16 and 18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 1709

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-6, 8 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Kiguchi (JP 2001-228159).

Regarding claim 1, Kiguchi discloses a chemical reactor comprising:

A pair of substrates joined to each other (Drawing 3 (11, 17));

a micro (70 micrometers, paragraph 18) flow path (Drawing 1 (14))

provided between the substrates; and

an injection section (Drawing 4) which injects and supplies a material into the micro flow path by and inkjet head (paragraph 21).

The inclusion of the material and reactions taken upon by said material does not distinguish the apparatus over the prior art. Apparatus claims must be structurally distinguishable from the prior art (MPEP § 2114). Furthermore, the material worked on does not limit an apparatus claim (MPEP § 2115).

Art Unit: 1709

Regarding claim 2, Kiguchi discloses the injection section being supplied from a material storage container provided outside the substrates (paragraph 21).

Regarding claims 3-6 and 8, the limitations of these claims do not impart any additional structure to the claimed invention. The material worked on does not limit an apparatus claim. See MPEP § 2115.

Regarding claim 10, Kiguchi discloses an inkjet head (paragraph 21) which includes an injection mechanism which injects the material via a nozzle (Drawing 5) by pressure due to vapor produced in the nozzle by film boiling through heating the material in the nozzle (paragraph 23).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kiguchi as applied to claim 1, and further in view of Shioya et al. (US 6,777,118).

Regarding claims 11 and 12, Kiguchi discloses all of the claims limitations as discussed with regard to claim 1 above, but does not teach a heat source for heating the flow path or the heat source being a thin film heater.

Shioya teaches a microreactor (Fig. 84) including a micro flow path (204) that is used to generate hydrogen for a fuel cell (see abstract).

Shioya also teaches a heat source (Fig. 84, (206)) as a thin film heater, which heats the said flow path (col. 103, lines 9-14) in order facilitate forming vapors of reactants introduced into said microreactor (col. 102 line 65 – col. 103 line 14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the microreactor of Kiguchi and the heat source of Shioya in order to facilitate the vaporization of reactants in the microreactor.

5. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kiguchi and Shioya as applied to claim 11 above, and further in view of Tonkovich et al. (US 6,969,506).

Regarding claim 13, the modified Kiguchi fails to teach a heat source with a fluid to be supplied in a flow path provided in a surface of one of the pair of substrates which is opposite to a surface facing the other substrate.

Tonkovich also teaches a microreactor (Fig. 8) that contains microchannels where reactions are carried out (col. 1 lines 50-54).

Tonkovich teaches a fluid (air or hydrogen, col. 30 lines 58-62) which will be the heat source (when it is combusted) supplied in a flow path (Fuel, Fig. 8) provided in a surface on one of the pair of substrates, which is opposite to a surface facing the other of the pair of substrates (See Fig. 8).

Tonkovich teaches this heat source in such an orientation in order to facilitate the exchange of heat from an exothermic reaction (combustion) to drive an endothermic reaction (such as steam reforming) (col. 1 lines 54-59).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the microreactor of Kiguchi with the orientation and heat source of Tonkovich in order to facilitate the exchange of heat from an exothermic reaction to drive an endothermic reaction.

Regarding claims 14 and 15, the modified Kiguchi fails to teach a heat source with a combustion reaction furnace further comprising an injection section which injects and supplies the combustion fuel.

Tonkovich teaches a heat source coming from a combustion reaction (col. 1 lines 50-54) and exchanging heat with a separate reaction, such as an endothermic reaction, in order to provide heat to drive the endothermic reaction (col. 1 lines 56-59).

Tonkovich also teaches a fuel injection section that injects and supplies the combustion fuel (col. 30 lines 45-48). Tonkovich teaches this 'distributed' fuel injection section to evenly inject fuel into a combustion channel in order to supply fuel for the combustion reaction (col. 30 lines 60-64).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the microreactor of Kiguchi with the combustion furnace and fuel injection system of Tonkovich in order to combust the fuel, create heat energy and drive an endothermic reaction.

Art Unit: 1709

6. Claims 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Markoski et al. (US 2003/0134163 A1) in view of Strand et al. (US 2002/0176804 A1).

Regarding claim 16, Markoski discloses a chemical reactor (Fig. 7 (20)) comprising:

A microreactor (20, with a microchannel (26) for microfluidic fluidic flow) which causes an oxidative reaction (paragraph 8) in a furnace (microchannel (26)); and

an oxidizing agent supply section (see Fig. 7 (oxidant pump)), which supplies a liquid oxidizing agent (such as hydrogen peroxide, paragraph 50) into the furnace (paragraph 61).

The inclusion of a material and reactions taken upon by said material does not distinguish the apparatus over the prior art. Apparatus claims must be structurally distinguishable from the prior art (MPEP § 2114). Furthermore, the material worked on does not limit an apparatus claim (MPEP § 2115).

Markoski fails to teach an inkjet head in the oxidizing agent supply section.

Strand discloses a microfluidic device (5) that can be used for reacting reagents (paragraph 8, bottom third) in microchannels.

Strand teaches a piezoelectric driven pump to supply liquids to the microchannels at low flow rates (paragraph 46, bottom third). One skilled in the art would recognize that an inkjet head is a piezoelectric pump, as is shown by Blanchard (US 6,384,210) (col. 1 lines 60-67).

Art Unit: 1709

Strand teaches this inkjet head in order for a pumping section to be bubble and particle tolerant when pumping liquids (paragraph 46, bottom third).

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the inkjet head (piezoelectric pump) of Strand to the microreactor of Markoski in order for the pumping section to be more tolerant to bubbles and particles.

Regarding claim 18, the limitation of this claim does not impart any additional structure to the claimed invention. The material worked on does not limit an apparatus claim. See MPEP § 2115.

Response to Arguments

Claim Objections

7. The objection to claim 16 is withdrawn in light of applicant's amendment.

Prior Art Rejections

8. Applicant's arguments filed 6/8/07 have been fully considered but they are not persuasive.

35 USC 102 Rejections

9. Applicant argues that Kiguchi does not disclose, teach or suggest the features of the chemical reactor of the claimed present invention whereby a liquid oxidizing agent is supplied by an inkjet head to cause one of: (i) an oxidation reaction which oxidizes

Art Unit: 1709

carbon monoxide in a fuel including hydrogen, and (ii) a combustion reaction which combusts a combustion fuel with the liquid oxidizing agent.

Examiner respectfully disagrees. The inclusion of the material and reactions taken upon by said material does not distinguish the apparatus over the prior art. Claimed materials used in an apparatus and claimed methods of using the apparatus are not given weight to a claimed apparatus as these features are directed at how the apparatus is used. Apparatus claims must be structurally distinguishable from the prior art (MPEP § 2114). Furthermore, the material worked on does not limit an apparatus claim (MPEP § 2115).

10. In response to applicant's argument that Kiguchi and Markoski do not teach the application of a liquid in an oxidation reaction to solve the problem of heating efficiency, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

11. Applicant argues that since the aqueous solution in Markoski et al is circulated by an oxidant pump and reused, it is not necessary to control supply of the aqueous solution by the inkjet head in small amounts as in the case of the claimed present invention. Applicant further argues that since the circulation of Markoski et al is a closed system, little heat is released, and Markoski et al does not have the problem of

Art Unit: 1709

heat efficiency being decreased due to absorption of heat from a non-oxidizing agent (nitrogen) of a wasteful volume by intake of atmospheric air.

The examiner respectfully disagrees. It is noted that the features upon which applicant relies (i.e., an 'open system' of circulating oxidant) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

12. Applicant argues that it would not be obvious to one of ordinary skill to apply a liquid ejection head of Kiguchi to the oxidizing agent supply means of the fuel cell or Markoski.

The examiner agrees with applicant, as no modifications of Kiguchi were made in view of Markoski in the office action of 3/8/07.

13. Applicant's arguments with respect to Kiguchi and Markoski regarding a chemical composition of a plurality of materials and reaction of said plurality of materials have been considered but are moot in view of the new ground(s) of rejection necessitated by amendment. Furthermore, a manner of operating a device does not differentiate an apparatus claim from the prior art (MPEP § 2114) and the material worked on does not limit an apparatus claim (MPEP § 2115).

Art Unit: 1709

35 USC 103 Rejections

14. Applicant argues that Shioya does not disclose applying a fluid oxidizing agent to an oxidizing reaction and a combustion reaction, nor controlling the fluid oxidizing agent in small amounts by the inkjet head

The examiner agrees with applicant as these were not the features of Shioya that were relied on in the rejection of claims 11 and 12.

15. Applicant argues that Tonkovich does not disclose applying a fluid oxidizing agent to an oxidizing reaction and a combustion reaction, nor controlling the fluid oxidizing agent in small amounts by the inkjet head.

The examiner agrees with applicant, as these were not the features of Tonkovich that were relied on in the rejection of claims 13-15.

16. Applicant argues that Blanchard does not disclose applying a fluid oxidizing agent to an oxidizing reaction and a combustion reaction, nor controlling the fluid oxidizing agent in small amounts by an inkjet head.

The examiner agrees with applicant, however, Blanchard was not used as a prior art rejection. Blanchard was used to show the knowledge of one of ordinary skill in the art at the time of the invention.

Art Unit: 1709

Conclusion

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Merkling whose telephone number is 571-272-9813. The examiner can normally be reached on Monday - Friday 8:30-4:30pm EST.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa D. Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1709

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MJM

MJM


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